

10G DWDM SFP+ C-band Tunable 40km DOM Transceiver

DW-SFP10G-40-C



Applications

- DWDM 10Gb/s SONET/SDH
- DWDM 10Gb/s Ethernet & 10Gb/s Fibre Channel
- DWDM 10Gb/s SONET/SDH w/FEC
- DWDM 10Gb/s Ethernet & 10Gb/s Fibre Channel w/FEC

Features

- Up to 40km transmission on SMF
- Support Multi Rate 9.95Gbps to 11.3Gbps with CDR, 8.5Gbps bypass CDR
- Monolithic MZM Tunable TOSA
- PIN receiver
- 50GHz ITU-based channel spacing (C-Band) with a wavelength locker
- SFI electrical interface
- 2-wire interface for integrated Digital Diagnostic monitoring
- SFP+ MSA package with duplex LC conn
- Hot pluggable
- Very low EMI and excellent ESD protection
- +3.3V power supply Power consumption less than 2.1W
- Operating case temperature: 0~ 75°C

Description

10G SFP+ ER DWDM Tunable is a high performance, cost effective module, which is supporting multi rate 9.95Gbps to 11.3Gbps with CDR, 8.5Gbps bypass CDR, and transmission distance up to 40km on SM fiber. The transceiver consists of two sections: The transmitter section incorporates a laser driver and a TTOSA. The receiver section consists of a PIN integrated with a transimpedance preamplifier (TIA). The module is hot pluggable into the 20-pin connector. The high-speed electrical interface is base on low voltage logic, with nominal 100ohms differential impedance and AC coupled in the module.

The optical output can be disabled by LVTTTL logic high-level input of TX_DIS. Transmit Fault (Tx_Fault) is provided to indicate that the module transmitter has detected a fault condition related to laser operation or safety. Loss of signal (RX_LOS) output is provided to indicate the loss of an input optical signal of receiver.

A serial EEPROM in the transceiver allows the user to access transceiver monitoring and configuration data via the 2-wire SFP management interface. This interface uses a single address, A0h, with a memory map divided into a lower and upper area. Basic digital diagnostic (DD) data is held in the lower area while specific data is held in a series of tables in the high memory area.

Product Specifications

I. Absolute Maximu Rating

Parameter	Symbol	Min	Max	Unit	Notes
Storage Temperature	TS	-40	85	°C	
Power Supply Voltage	Vcc3	0	3.63	V	
Relative Humidity (non-condensation)	RH	5	+85	%	Note1
Damage Threshold	Pmax			dBm	

II. Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Operating Case Temperature	TC	0	25	75	°C	
Supply Voltage	VCC	3.13	3.3	3.47	V	
Power Supply Current	PD	-	-	670	mA	
Data Rate		8.5	10.3125	11.3	Gbps	
Transmission Distance		-	-	40	Km	

III. Transmitter Operating Characteristic--Optical, Electrical

Parameter	Symbol	Min	typical	Max	Unit	Notes
Data Rate	DR	8.5	10.3125	11.3	Gbps	
Center Wavelength	CW	191.30		196.05	THz	
Wavelength range	λ C	1529.16		1567.13	nm	
Center Frequnqcy Variation	CFV	0		+/-2.5	GHz	
-20dB Spectral Width	$\Delta\lambda$ 20			0.3	nm	
Side mode Suppression Ratio	SMSR	30		-	nm	
Laser Off Power	Poff			-30	dBm	
Transmitter Reflectance	TR			-12	dB	
Average Optical Power	PO	-1	0.5	3	dBm	
ExtinctionRatio	ER	8.2			dB	
Cross Point of Eye	CP	40%		52%		
Transmitter Dispersion Penalty	TDP			3	dB	
Transmitter Dispersion Tolerance (CD window with 2dB OSNR penalty)	TDT	-700		700	km ps/nm	
Relative Intensity Noise	RIN12OMA			-128	dB/Hz	
Optical Eye Mask	EMM	5				
Tx Input Diff Voltage	VI	200		850	mV	

IV. Receiver Operating Characteristic-Optical, Electrical

Parameter	Symbol	Min	typical	Max	Unit	Notes
Data Rate	DR	8.5	10.3125	11.3	Gbps	
Center Wavelength	CW	1260		1600	nm	
Sensitivity @(BER=1E-12, PRBS 2^31-1, NRZ, 9.95Gbps~10.7Gbps data rate	Psen	1529.16		-16(EOL)	dBm	
Sensitivity @(BER=2.0E-03, PRBS 2^31-1, NRZ,11.3Gbps data rate, dispersion 800ps/nm, at room temperature and OSNR >31dB)	Psen			-19 (EOL)	dBm)	
B2B OSNR Tolerance BOL @ 2E-3 Test condition: A: optical filter type and bandwidth: flattop filter -3dB bandwidth 84 GHz, OSA res 0.1nm for noise bandwidth. B: Input optical power range: 0--14dBm C:9.9Gbps~11.3Gbps data rate range D:-5~70°C E: Under the optimal threshold or 50% threshold						
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Saturation Power (EOL)	SP	-1			dBm	
Input Optical Power(no	IOP	4			dBm	

V. Digital Diagnostic Functions

Parameter	Symbol	Min	Typical	Max	Units	Notes
Temperature Monitor Absolute Error	DMI_Temp	-3		3	°C	Over operating temperature
Supply Voltage Monitor Absolute Error	DMI_Vcc	-3%		3%	V	Over operating voltage
Bias Current Monitor Absolute Error	DMI_Ibias	-10%		10%	mA	
Laser Power Monitor Absolute Error	DMI_Tx	-3		3	dB	

VI. Control and Status/OTiming

Parameter	Symbol	Min	Typ.	Max	Unit	Notes
TX Disable Assert Time	t_off			100	μs	Note1
TX Disable Negate Time	t_on			2	ms	Note2
Time to initialize including reset of TX_Fault	t_init			300	ms	Note3
TX Fault Assert Time	t_fault_on			1	ms	Note4
TX Fault Reset Time	t_reset	10			μs	Note5
LOS Assert Time	t_loss_on			100	μs	Note6
LOS Deassert Time	t_loss_off			100	μs	Note7

VII. Wavelength Table: C-band λ_c Wavelength Guide Pin Descriptions

Channel	Wavelength (nm)	Frequency(THZ)	Channel	Wavelength (nm)	Frequency(THZ)
C13	1567.13	191.30	H13	1566.72	191.35
C14	1566.31	191.40	H14	1565.91	191.45
C15	1565.50	191.50	H15	1565.09	191.55
C16	1564.68	191.60	H16	1564.27	191.65
C17	1563.86	191.70	H17	1563.46	191.75
C18	1563.05	191.80	H18	1562.64	191.85
C19	1562.23	191.90	H19	1561.83	191.95
C20	1561.42	192.00	H20	1561.01	192.05
C21	1560.61	192.10	H21	1560.20	192.15
C22	1559.79	192.20	H22	1559.39	192.25
C23	1558.98	192.30	H23	1558.58	192.35
C24	1558.17	192.40	H24	1557.77	192.45
C25	1557.36	192.50	H25	1556.96	192.55
C26	1556.55	192.60	H26	1556.15	192.65
C27	1555.75	192.70	H27	1555.34	192.75
C28	1554.94	192.80	H28	1554.54	192.85
C29	1554.13	192.90	H29	1553.73	192.95
C30	1553.33	193.00	H30	1552.93	193.05
C31	1552.52	193.10	H31	1552.12	193.15
C32	1551.72	193.20	H32	1551.32	193.25
C33	1550.92	193.30	H33	1550.52	193.35
C34	1550.12	193.40	H34	1549.72	193.45
C35	1549.32	193.50	H35	1548.91	193.55
C36	1548.51	193.60	H36	1548.11	193.65
C37	1547.72	193.70	H37	1547.32	193.75
C38	1546.92	193.80	H38	1546.52	193.85
C39	1546.12	193.90	H39	1545.72	193.95

C40	1545.32	194.00	H40	1544.92	194.05
C41	1544.53	194.10	H41	1544.13	194.15
C42	1543.73	194.20	H42	1543.33	194.25
C43	1542.94	194.30	H43	1542.54	194.35
C44	1542.14	194.40	H44	1541.75	194.45
C45	1541.35	194.50	C45	1541.35	194.50
C46	1540.56	194.60	H46	1540.16	194.65
C47	1539.77	194.70	H47	1539.37	194.75
C48	1538.98	194.80	H48	1538.58	194.85
C49	1538.19	194.90	H49	1537.79	194.95
C50	1537.40	195.00	H50	1537.00	195.05
C51	1536.61	195.10	H51	1536.22	195.15
C52	1535.82	195.20	H52	1535.43	195.25
C53	1535.04	195.30	H53	1534.64	195.35
C54	1534.25	195.40	H54	1533.86	195.45
C55	1533.47	195.50	H55	1533.07	195.55
C56	1532.68	195.60	H56	1532.29	195.65
C57	1531.90	195.70	H57	1531.51	195.75
C58	1531.12	195.80	H58	1530.72	195.85
C59	1530.33	195.90	H59	1529.94	196.95
C60	1529.55	196.00	H60	1529.16	196.05

Notes:

1. When the module is power cycled it will automatically go to the last channel selected, or when Tx_Disable asserted and then re-enabled, the module returns to the last channel selected.

Notes:

- [1]Time from rising edge of TX Disable to when the optical output falls below 10% of nominal.
- [2]Time from falling edge of TX Disable to when the modulated optical output rises above 90% of nominal.
- [3]From power on or negation of TX Fault using TX Disable.
- [4]Time from fault to TX fault on.
- [5]Time from TX fault to TX nominal.
- [6]Time from LOS state to RX LOS assert.
- [7]Time from non-LOS state to RX LOS deassert.

Pin-out Definitions

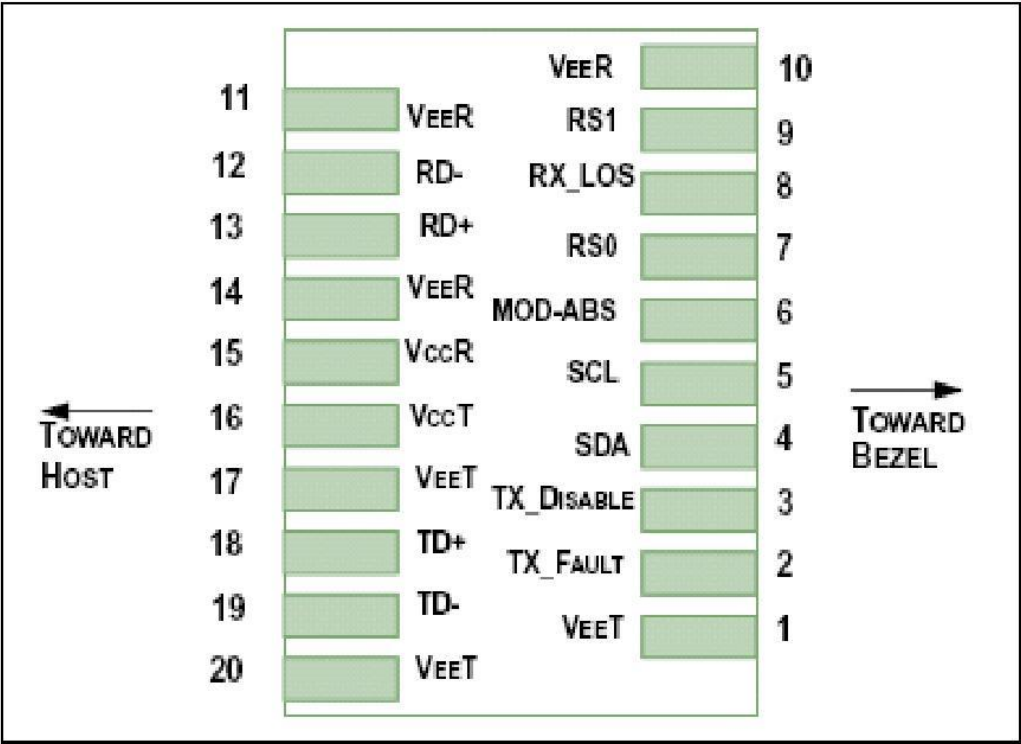


Figure 1

VIII. Pin Function Definitions

	Logic	Symbol	Name/Description	Note
1		VeeT	Module Transmitter Ground	Note1
2	LVTTTL-O	TX_Fault	ModuleTransmitter Fault	Note2
3	LVTTTL-I	TX_Disable	Transmitter Disable; Turnsofftrans mitterlaseroutput	Note3
4	LVTTTL-I/O	SDA	2-wire Serial Interface Data Line (Same as MOD-DEF2 asdefinedin the INF-8074i)	Note4
5	LVTTTL-I/O	SCL	2-wire Serial Interface Clock (Same as MOD-DEF1 as defined intheINF-8074i)	Note4
6		MOD_ABS	Module Absent, connected to VeeT or VeeR in the module	Note5
7	LVTTTL-I	RS0	Rate Select 0	
8	LVTTTL-O	RX_LOS	Receiver Loss of Signal Indication (In FC designated as RX_LOS, in SONET designated as LOS, and in Ethernet designated at Signal Detect)	Note2
9	LVTTTL-I	RS1	Rate Select 1	
10		VeeR	Module Receiver Ground	Note1
11		VeeR	Module Receiver Ground	Note1
12	CML-O	RD-	Receiver Inverted Data Output	
13	CML-O	RD+	Receiver Non-Inverted Data Output	
14		VeeR	Module Receiver Ground	Note1
15		VccR	Module Receiver 3.3 V Supply	

16		VccT	Module Transmitter 3.3 V Supply	Note1
17		VeeT	Module Transmitter Ground	
18	CML-I	TD+	Transmitter Non-Inverted Data Input	
19	CML-I	TD-	Transmitter Inverted Data Input	
20		VeeT	Module Transmitter Ground	Note1

Notes:

- [1] The module signal ground pins, VeeR and VeeT, shall be isolated from the module case.
- [2] This pin is an open collector/drain output pin and shall be pulled up with 4.7k-10kohms to Host_Vcc on the host board. [3] Pull ups can be connected to multiple power supplies, however the host board design shall ensure that no module pin has voltage exceeding module VccT/R + 0.5 V.
- [4] This pin is an open collector/drain input pin and shall be pulled up with 4.7k-10kohms to VccT in the module. [5] See SFF-8431 4.2.2-wire Electrical Specifications.
- [6] This pin shall be pulled up with 4.7k-10kohms to Host_Vcc on the host board.

Block Diagram of Transceiver

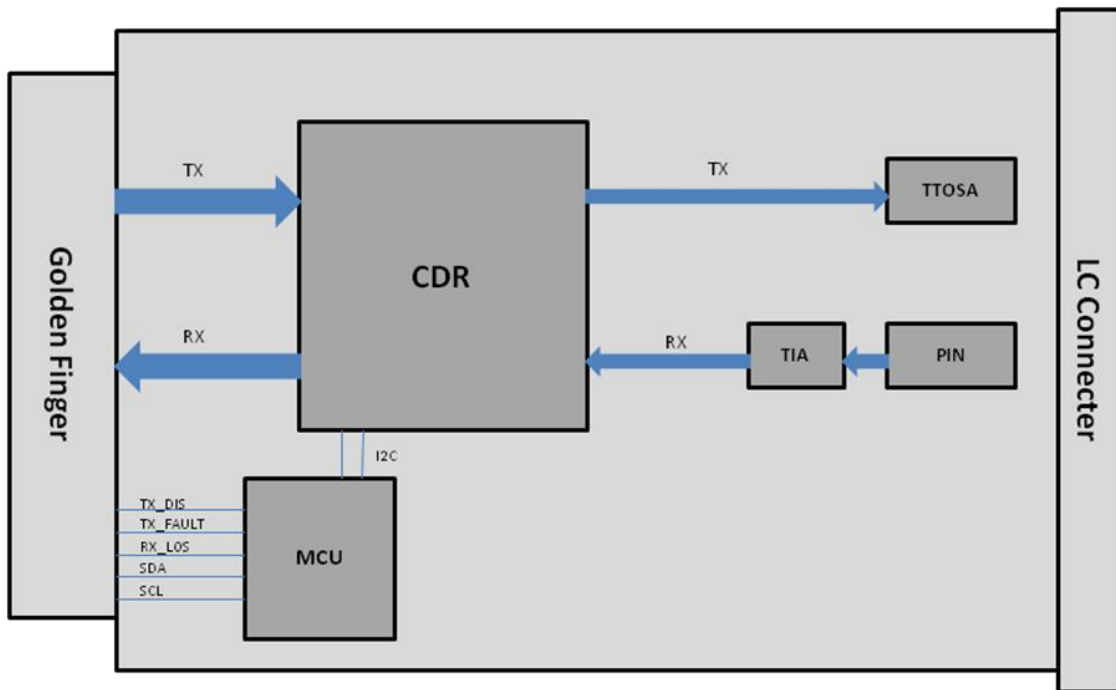


Figure 2

<Transmitter Section> :

The transmitter converts 10Gbit/s serial PECL or CML electrical data into serial optical data. An open collector compatible Transmit Disable (Tx_Dis) is provided. A logic “1” or no connection on this pin will disable the laser from transmitting. A logic “0” on this pin provides normal operation. An open collector compatible Transmit Fault (Tx_Fault) is provided. TX_Fault is a module output contact that when high, indicates that the module transmitter has detected a fault condition related to laser operation or safety. The TX_Fault output contact is an open drain/collector and shall be pulled up to the Vcc_Host in the host with a resistor in the range 4.7-10 kΩ. TX_Disable is a module input contact. When TX_Disable is asserted high or left open, the SFP+ module transmitter output shall be turned off. This contact shall be pulled up to VccT with a 4.7 kΩ to 10 kΩ resistor.

<Receiver Section> :

The receiver converts 10Gbit/s serial optical data into serial PECL/CML electrical data. An open collector compatible Loss of Signal is provided. Rx_LOS when high indicates an optical signal level below that specified in the relevant standard. The Rx_LOS contact is an open drain/collector output and shall be pulled up to Vcc_Host in the host with a resistor in the range 4.7-10 kΩ, or with an active termination. Power supply filtering is recommended for both the transmitter and receiver. The Rx_LOS signal is intended as a preliminary indication to the system in which the SFP+ is installed that the received signal strength is below the specified range. Such an indication typically points to non-installed cables, broken cables, or a disabled, failing or a powered off transmitter at the far end of the cable.

Recommended Interface Circuit

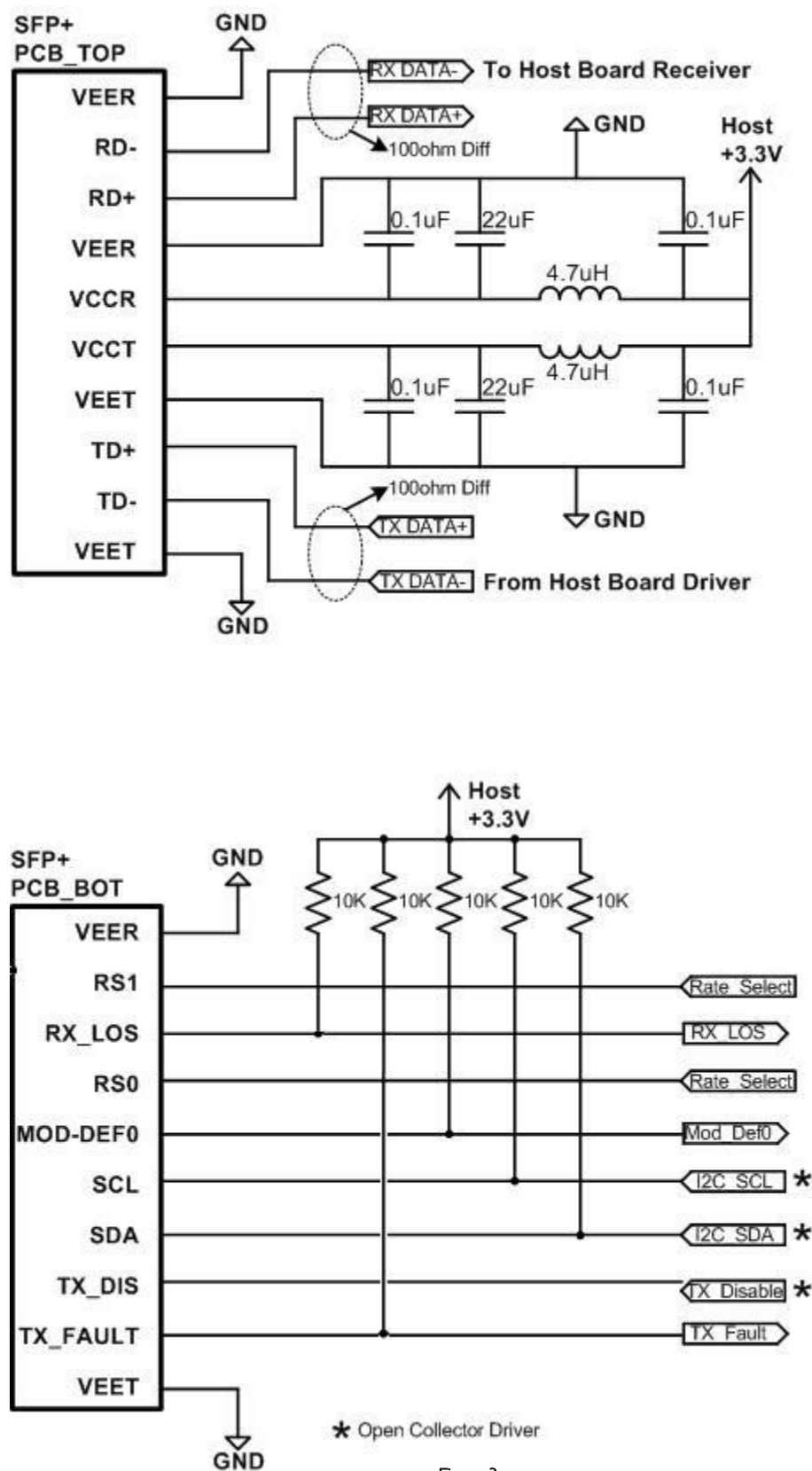


Figure 3

Dimensions

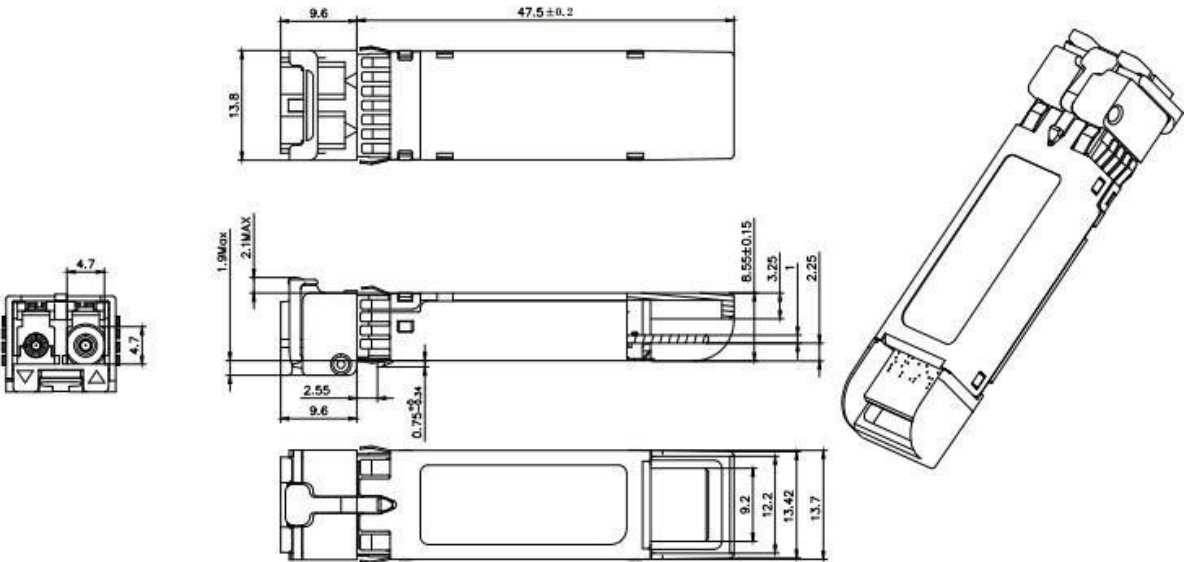


Figure 4

Digital Diagnostic Memory Map

2 wire address 1010000X (A0h)

0	Serial ID Defined by SFP MSA (96 bytes)
95	Vendor Specific (32 bytes)
127	Reserved in SFP MSA (128 bytes)
255	

2 wire address 1010001X (A2h)

0	Alarm and Warning Thresholds (56 bytes)
55	Cal Constants (40 bytes)
95	Real Time Diagnostic Interface (24 bytes)
119	Vendor Specific (8 bytes)
127	User Writable EEPROM (120 bytes)
247	Vendor Specific (8 bytes)
255	

Figure 3

EEPROM Information

IX. EEPROM Serial ID Memory Contents(A0h)

Addr.	FieldSize	NameofField	Hex	Description
	(Bytes)			
0	1	Identifier	03	SFP+
1	1	Ext.Identifier	04	SFP function is defined by seriall Donly
2	1	Connector	07	LC Connector
3-10	8	Transceiver	8000000000 0000 00	10G Ethernet Compliance Codes:
11	1	Encoding	03	NRZ
12	1	BR,Nominal	6F	11100Mb/s
13	1	Rate Identifier	0E	10/8G
14	1	Length(9um)km	28	Transceiver transmit distance,40km
15	1	Length (9um)100m	FF	Transceiver transmit distance,
16	1	Length(50um)10m	00	Transceiver transmit distance
17	1	Length(62.5um)10m	00	Transceiver transmit distance
18	1	Length(Copper)	00	Not compliant
19	1	Length(50umOM3)	00	Not compliant
20-35	16	Vendorname	48472047454E55494E4520202020202020	“HGGENUINE” Vendor Name(ASCII)
36	1	Reserved	00	
37-39	3	Vendor OUI	000000	
40-55	16	Vendor PN	4D5452532D325436	“10G SFP+ ER DWDM Tunable”PartNo.(ASCII)
			30 2D 30 31 20 20 20 20	
56-59	4	Vendorrev	312E30 20	“1.0” (ASCII)
60-61	2	Wavelength	0000	Transceiver wavelength
62	1	Reserved	00	
63	1	CC_BASE	CS(Variable)	Check code for Base ID Fields
64-65	2	Options	3EEA	TX_DISABLE,TX_FAULT and Loss of Signal implemented.
66	1	BR,MAX	00	Not Specified
67	1	BR,MIN	00	Not Specified
68-83	16	Vendor SN	SN(Variable)	Serial Number of transceiver(ASCII).
84-91	8	Date code	DC(Variable)	Manufactory Date Code.

92	1	Diagnostic Monitoring Type	68	Digital diagnostic monitoring implemented, “Internally calibrated” is implemented
93	1	Enhanced Options	FA	Optional Alarm/Warning flags implemented for all monitored quantities, Optional Soft TX_Disable control and monitoring implemented, Optional SoftTX_FAULT monitoring implemented, Optional SoftRX_LOS monitoring implemented
94	1	SFF_8472 Compliance	08	functionality described in Rev12.0 of SFF-8472
95	1	CC_EXT	CS(Variable)	Checksum for Extended ID Field.

X. Memory contents of Diagnostic Monitor Function(A2h)

Addr.	FieldSize	NameofField	Description
	(Bytes)		
00-01	2	Temperature High Alarm	85°C
02-03	2	Temperature Low Alarm	-10°C
04-05	2	Temperature High Warning	75°C
06-07	2	Temperature Low Warning	0°C
08-09	2	Vcc High Alarm	3.63V
10-11	2	Vcc Low Alarm	2.97V
12-13	2	Vcc High Warning	3.465V
14-15	2	Vcc Low Warning	3.135V
16-17	2	Bias High Alarm	80mA
18-19	2	Bias Low Alarm	0mA
20-21	2	Bias High Warning	70mA
22-23	2	Bias Low Warning	0mA
24-25	2	TX Power High Alarm	5dBm
26-27	2	TX Power Low Alarm	-3dBm
28-29	2	TX Power High Warning	3dBm
30-31	2	TX Power Low Warning	-1dBm
32-33	2	RX Power High Alarm	1dBm
34-35	2	RX Power Low Alarm	-18dBm
36-37	2	RX Power High Warning	-1dBm
38-39	2	RX Power Low Warning	-16dBm

XI. Ordering Information

PartNo	Specification								
	Pack	Rate	Tx	Pout	Rx	S	Top	Reach	Others
DW-SFP10G-40-C	SFP+	10G	DWDM	-1~+3dBm	PIN	<-16dBm	0~75°C	40km	DDM/RoHS